Grand Canyon Monitoring and Research Program

U.S. Department of the Interior
U.S. Geological Survey

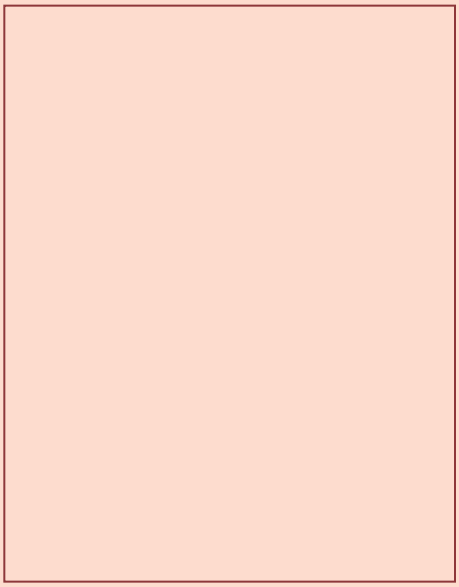
Controlled Flooding of the Colorado River in Grand Canyon: the Rationale and Data-Collection Planned

Controlled flooding of the Colorado River by releases from Glen Canyon Dam has been proposed as a way to manage sediment and other resources in the Grand Canyon. Floods are a natural occurrence of rivers and, in the case of the Colorado River, the architect of the Grand Canyon landscape. Scientists have proposed a controlled flood in response to resource managers' request for ways to restore some of the pre-dam resource conditions. Floods are expected to suspend sand moved to the river bottom by lower flows and deposit it along the river banks where it will be above water after the flood recedes. In this way, the limited sand resources can be utilized to preserve habitat for plants and animals and for use by river runners and campers. Because some effects of a clear water flood from Glen Canyon Dam are uncertain, the U.S. Geological Survey (USGS), in cooperation with the Bureau of Reclamation and the National Park Service, has planned a short period of controlled flooding to provide information for science-based decision-making.

Background

Glen Canyon Dam began to store water in 1963. The dam made possible the production of electricity and the irrigation of crops and created new opportunities for recreation. By many measures, life in the Southwest has been improved. But the presence of the dam and regulation of flow have greatly reduced the size and frequency of floods, the amount of sediment in the river, and the annual variation in water temperature.

The river environment changed within Glen Canyon National Recreation Area, Grand Canyon National Park, and tribal lands of the Navajo, Havasupai, and Hualapai people—in other words, areas set aside for the preservation of the cultural and natural resources. Concern about the environmental effects of the dam and its operation caused the Bureau of Reclamation to initiate a series of studies known as the Glen Canyon Environmental Studies (GCES). Efforts by concerned parties resulted in the enactment into law of the Grand Canyon Protection Act of 1992 and the completion of an Environmental Impact Statement (EIS). The Act and the EIS provide for use of Glen Canyon Dam to manage the resources of the river corridor, including the use of periodic controlled flooding.



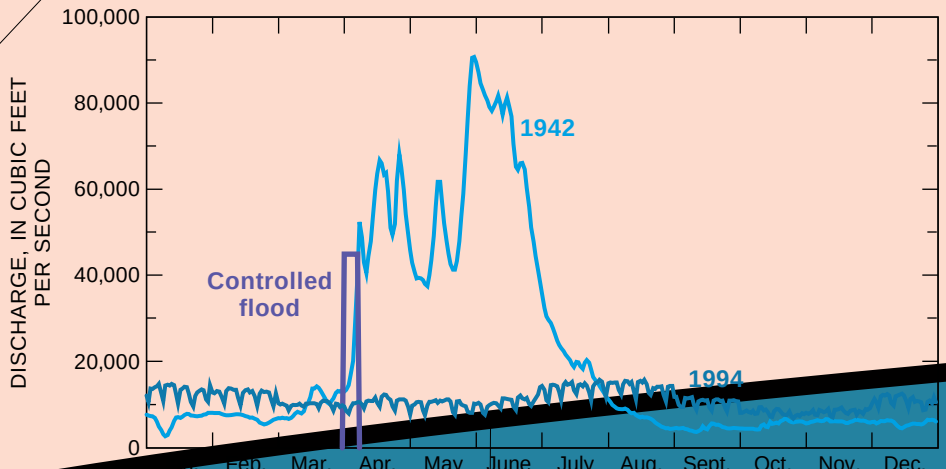
Bud Rusho, Bureau of Reclamation, 1984

High-flow release from Glen Canyon Dam in 1984.

Controlled-Flood Rationale

Before 1963, melting snow in the upper Colorado River basin produced high flows that raced through the Grand Canyon each spring. An average peak discharge of 93,400 ft^3/s scoured large volumes of sediment from the river bottom. Later in the summer, receding floodwaters deposited this scoured sediment and also sediment carried in from tributaries. This annual scour and fill process maintained large sand bars along the river banks, kept sand bars clear of vegetation, and kept debris fans—deposits of cobbles and boulders that format the mouths of tributaries—from constricting the river. Reduced frequency of flooding since flow regulation began has reduced the size of sand bars and allowed vegetation to encroach on the channel, debris fans to build up, and backwater areas used by native fish to fill in.

The last decade of study has greatly expanded scientists' understanding of the Colorado River in Grand Canyon. On the basis of this knowledge, scientists predict that periodic high flows can be used to retain sand in the canyon by depositing it along river banks. Sand submerged in the river is not stationary but is slowly being moved downstream along the river bottom. Floods have the hydraulic energy necessary to suspend sand and to



The proposed controlled flood compared to pre-dam (1942) and post-dam (1994) flows.